



SUGHRUE MION, PLLC

A circular black ink stamp. The outer ring contains the text "OIP" at the top and "PATENT & TRADEMARK OFFICE" at the bottom. In the center, the date "APR 03 2002" is stamped. The text "JC139" is handwritten in the upper right quadrant of the stamp.

April 3, 2002

BOX PCT

Commissioner for Patents
Washington, D.C. 20231

10/089656 JC02 Rec'd PCT/PTD 03 APR 2002
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PCT/JP00/05499
-filed August 17, 2000

Re: Application of Shinji MATSUI
MICRO THREE-DIMENSIONAL STRUCTURE, PRODUCTION METHOD
THEREFOR AND PRODUCTION DEVICE THEREFOR
Assignee: NEC CORPORATION
Our Ref: Q69377

Dear Sir:

The following documents and fees are submitted herewith in connection with the above application for the purpose of entering the National stage under 35 U.S.C. § 371 and in accordance with Chapter II of the Patent Cooperation Treaty:

- ☐ an executed Declaration and Power of Attorney.
- ☒ an English translation of the International Application.
- ☒ 6 sheet(s) of drawings.
- ☐ an English translation of Article 19 claim amendments.
- ☐ an English translation of Article 34 amendments (annexes to the IPER).
- ☐ an executed Assignment and PTO 1595 form.
- ☐ a Form PTO-1449 listing the ISR references, and a complete copy of each reference.
- ☐ a Preliminary Amendment

The Declaration and Power of Attorney, Assignment, will be submitted at a later date.

It is assumed that copies of the International Application, the International Search Report, the International Preliminary Examination Report, and any Articles 19 and 34 amendments as required by § 371(c) will be supplied directly by the International Bureau, but if further copies are needed, the undersigned can easily provide them upon request.

The Government filing fee is calculated as follows:

Total claims	14	-	20	=		x	\$18.00	=	<u>\$0.00</u>
Independent claims	2	-	3	=		x	\$84.00	=	<u>\$0.00</u>
Base Fee									<u>\$890.00</u>

TOTAL FEE

\$890.00



Sughrue

SUGHRUE MION, PLLC

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Washington, DC 20231
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Attorney Docket No. Q69377
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A check for the statutory filing fee of \$890.00 is attached. You are also directed and authorized to charge or credit any difference or overpayment to Deposit Account No. 19-4880. The Commissioner is hereby authorized to charge any fees under 37 C.F.R. §§ 1.16, 1.17 and 1.492 which may be required during the entire pendency of the application to Deposit Account No. 19-4880. A duplicate copy of this transmittal letter is attached.

Priority is claimed from:

Country

Application No

Filing Date

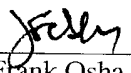
Japan

11-286337

October 7, 1999

Respectfully submitted,

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IC10 Rec'd PCT/PTO 03 APR 2002

MICRO THREE-DIMENSIONAL STRUCTURE, PRODUCTION
METHOD THEREFOR AND PRODUCTION DEVICE THEREFOR

TECHNICAL FIELD

5 The present invention relates to a micro three-
dimensional structure, the outer shape of which is on the
order of several micrometers to nanometers, and produced
using a CVD method, particularly, a focused ion beam
method, a production method therefor, and a production
10 device therefor.

BACKGROUND ART

Products of micro three-dimensional structure
include, for example, a gear, a bellows, a coil, a drill,
a knife, and the like which are used as micromachines.
15 They can be applied as well to a DNA handling miniature
tool, a micro engine, a micro shutter, and a probe for a
scanning probe microscope.

On the other hand, the micro three-dimensional
structure is also related to the field of direct draw
20 three-dimensional lithography which is now under
investigation for purposes of higher integration of
semiconductor devices.

CVD based methods of producing a micro three-
dimensional structure are classified into three which use
25 light (laser), a focused electron beam, and a focused ion
beam, respectively. In the lithography, production of

outer shape) having a complicated structure, a production method therefor and production device therefor.

The present invention achieves the above object by:

[1] a method of producing a micro three-dimensional
5 structure, characterized by comprising the steps of: (a)
irradiating a focused ion beam to a sample while supplying
a material gas to form a deposit; (b) releasing secondary
electrons from the deposit hit by ions to allow the
secondary electrons to form a terrace on the deposit; (c)
10 deflecting the focused ion beam in a desired direction of
the terrace based on a set amount from a focal position
controlling apparatus; (d) forming an overlying deposit at
a displaced position on the terrace based on the
deflection amount; and (e) repeating the steps (b) to (d)
15 in sequence to form a set micro three-dimensional
structure.

[2] A method of producing a micro three-dimensional
structure described in [1] is characterized in that a beam
source is Ga^+ , Si^+ , Si^{++} , Be^+ , Be^{++} , Au^+ , or Au^{++} as liquid
20 metal ions, or H^+ or He^+ as a gas ion source;

[3] A method of producing a micro three-dimensional
structure described in [1] is characterized in that the
material gas is WF_6 , $\text{W}(\text{CO})_6$, $\text{Mo}(\text{CO})_6$, $\text{Fe}(\text{CO})_5$, $\text{Ni}(\text{CO})_4$,
 $\text{Au}(\text{CH}_3)_2(\text{AcAc})$, $\text{Cu}(\text{HFACAc})_2$, or $\text{Al}(\text{CH}_3)_2$ as an
25 organometallic gas.

[4] A method of producing a micro three-dimensional

dimensional structure illustrating a fourth example of the present invention.

BEST MODE FOR CARRYING OUT THE INVENTION

In the following, an embodiment of the present invention will be described in detail.

Fig. 1 is a diagram generally illustrating the principles of production steps for a micro three-dimensional structure according to an embodiment of the present invention.

(1) First, as illustrated in Fig. 1(a), a focused ion beam 4 is irradiated while a material gas 3 is supplied onto a sample (substrate) 1 from a nozzle 2. In other words, focused ion beam assisted CVD is applied to form first layer deposit 5.

(2) Subsequently, as illustrated in Fig. 1(b), ions impinge on first layer deposit 5 to release secondary electrons 6, and terrace 7 is formed of secondary electrons 6.

(3) Next, as illustrated in Fig. 1(c), focused ion beam 4 is deflected in a desired direction of terrace 7. As a result, second layer deposit 8 can be formed at a position on terrace 7 displaced by the deflected amount.

A process for producing a micro three-dimensional structure actually produced using the principle diagram for the production of the micro three-dimensional structure, described in connection with Fig. 1, will be

discussed with reference to Fig. 2.

(1) First, pyrene ($C_{16}H_{10}$) is supplied onto silicon substrate 100, on which a deposit is to be formed, as a carbon (C) source from a nozzle, while Ga^+ FIB is irradiated perpendicularly to the silicon substrate 100 at an accelerating voltage of 30 kV, to form carbon column 101 (having a diameter of $0.08 \mu m$) perpendicularly to silicon substrate 100.

(2) Subsequently, based on the principles illustrated in Fig. 1, an ion beam is slightly displaced on carbon column 101 to form a terrace on the order of several tens of nanometers in an ion beam scanning direction by spread of secondary electrons generated by the ion irradiation and having energy of several electron-
volts. After the terrace has been fully formed, the beam is scanned over a range within the spread of the secondary electrons (within several tens of nanometers). As a terrace has been fully formed after the beam was moved, the beam is again scanned over a range within the spread of the secondary electrons.

By repeating these steps, a micro three-dimensional structure formed of carbon column 102, and continuous carbon columns 103, 104, 105, 106, 107, 108, 109 and 110, sequentially in the space by further movements of the beam, can be produced corresponding to the movements of the ion beam.

In the following, the foregoing will be explained in detail.

Fig. 3 is a diagram for explaining the principles of a focused ion beam assisted CVD (maskless deposition)

5 method according to the present invention.

In this figure, after W film 12 is deposited on sample 11, W film 12 undergoes the focused ion beam assisted CVD. For example, W film 12 is irradiated with focused ion beam (Ga^+) 15 while $\text{W}(\text{CO})_6$ gas 14 is supplied from nozzle 13 as an organic metal gas.

Then, focused ion beam (Ga^+) 15 acts on $\text{W}(\text{CO})_6$ gas 14 to produce $\text{W} + 6\text{CO}\uparrow$. For reference, numeral 16 designates a $\text{W}(\text{CO})_6$ molecule, and the W film applied with the focused ion beam assisted CVD has a conductivity of 100 to 200 $\mu\Omega\cdot\text{cm}$.

Now, description will be made on an embodiment of the focused ion beam assisted CVD in the present invention.

(A) Used as a beam source is a liquid metal ion (Ga^+ , Si^+ , Si^{++} , Be^+ , Be^{++} , Au^+ , Au^{++} , or the like), or a gas ion source (H^+ , He^+ , or the like).

(B) Used as a material gas is an organometallic gas [WF_6 , $\text{W}(\text{CO})_6$, $\text{Mo}(\text{CO})_6$, $\text{Fe}(\text{CO})_5$, $\text{Ni}(\text{CO})_4$, $\text{Au}(\text{CH}_3)_2(\text{AcAc})$, $\text{Cu}(\text{HFACAc})_2$, $\text{Al}(\text{CH}_3)_2$, or the like], or an organic gas [pyrene ($\text{C}_{16}\text{H}_{10}$), styrene (C_8H_{10}), HMDS, HMCTS, or the like].

25 (C) A minimum beam diameter is 5 to 10 nm.

(D) The following features are provided:

in three turns for two minutes (at a period of 40 seconds) using a mainly C-based gas as an organic gas, and monovalent Ga ions as metal ions. The carbon micro coil thus produced can be utilized as a device effective in the absorption of electromagnetic waves which cause malfunctions of medical equipment and the like.

Fig. 6 is an explanatory diagram for a micro three-dimensional structure illustrating a second example of the present invention.

In this example, micro bellows 52 having an outer diameter ϕ_3 of 2.75 μm , a height h_1 of 6.1 μm , and a thickness d_1 of 0.1 μm or more could be produced using Ga⁺ FIB with an accelerating voltage of 30 kV, and a beam current of 16 pA for 300 seconds. The micro bellows thus produced is essential for fitting when a micro system is built.

Fig. 7 is an explanatory diagram for a micro three-dimensional structure illustrating a third example of the present invention.

20 In this example, a drill 53 having an outer diameter
 ϕ_4 of 0.1 μm could be produced using a mainly W-based gas
as an organic gas and monovalent Ga ions as metal ions. By
mounting the micro drill thus produced at the tip of a
micro motor, micro holes can be formed. For example, a
25 hole smaller than a red blood cell can be formed through a
blood vessel, thereby making it possible to prevent

hemorrhage when a medicine is injected.

Fig. 8 is an explanatory diagram for a micro three-dimensional structure illustrating a fourth example of the present invention.

5 In this example, a micro wine glass 54 having an outer diameter ϕ_5 of 2.75 μm and a height h_2 of 12 μm could be produced using Ga^+ FIB with an accelerating voltage of 30 kV, and a beam current of 16 pA for 600 seconds.

 The present invention is not limited to the
10 foregoing examples, but can be modified in various manners based on the gist of the present invention, and such modifications should not be eliminated from the scope of the present invention.

 As described above in detail, according to the
15 present invention, it is possible to produce a micro three-dimensional structure (micrometer- to nanometer-order outer shape) having a complicated structure.

INDUSTRIAL AVAILABILITY

 The present invention is suitable for the field of
20 the production of a micro three-dimensional structure having a complicated structure, and can be applied, for example, to semiconductor manufacturing processes.

155 156 157 158 159 160 161 162 163 164 165 166 167 168 169 170 171 172 173 174 175 176 177 178 179 180 181 182 183 184 185 186 187 188 189 190 191 192 193 194 195 196 197 198 199 200 201 202 203 204 205 206 207 208 209 210 211 212 213 214 215 216 217 218 219 220 221 222 223 224 225 226 227 228 229 230 231 232 233 234 235 236 237 238 239 240 241 242 243 244 245 246 247 248 249 250 251 252 253 254 255 256 257 258 259 260 261 262 263 264 265 266 267 268 269 270 271 272 273 274 275 276 277 278 279 280 281 282 283 284 285 286 287 288 289 290 291 292 293 294 295 296 297 298 299 300 301 302 303 304 305 306 307 308 309 310 311 312 313 314 315 316 317 318 319 320 321 322 323 324 325 326 327 328 329 330 331 332 333 334 335 336 337 338 339 340 341 342 343 344 345 346 347 348 349 350 351 352 353 354 355 356 357 358 359 360 361 362 363 364 365 366 367 368 369 370 371 372 373 374 375 376 377 378 379 380 381 382 383 384 385 386 387 388 389 390 391 392 393 394 395 396 397 398 399 400 401 402 403 404 405 406 407 408 409 410 411 412 413 414 415 416 417 418 419 420 421 422 423 424 425 426 427 428 429 430 431 432 433 434 435 436 437 438 439 440 441 442 443 444 445 446 447 448 449 450 451 452 453 454 455 456 457 458 459 460 461 462 463 464 465 466 467 468 469 470 471 472 473 474 475 476 477 478 479 480 481 482 483 484 485 486 487 488 489 490 491 492 493 494 495 496 497 498 499 500 501 502 503 504 505 506 507 508 509 510 511 512 513 514 515 516 517 518 519 520 521 522 523 524 525 526 527 528 529 530 531 532 533 534 535 536 537 538 539 540 541 542 543 544 545 546 547 548 549 550 551 552 553 554 555 556 557 558 559 560 561 562 563 564 565 566 567 568 569 570 571 572 573 574 575 576 577 578 579 580 581 582 583 584 585 586 587 588 589 590 591 592 593 594 595 596 597 598 599 600 601 602 603 604 605 606 607 608 609 610 611 612 613 614 615 616 617 618 619 620 621 622 623 624 625 626 627 628 629 630 631 632 633 634 635 636 637 638 639 640 641 642 643 644 645 646 647 648 649 650 651 652 653 654 655 656 657 658 659 660 661 662 663 664 665 666 667 668 669 670 671 672 673 674 675 676 677 678 679 680 681 682 683 684 685 686 687 688 689 690 691 692 693 694 695 696 697 698 699 700 701 702 703 704 705 706 707 708 709 710 711 712 713 714 715 716 717 718 719 720 721 722 723 724 725 726 727 728 729 730 731 732 733 734 735 736 737 738 739 740 741 742 743 744 745 746 747 748 749 750 751 752 753 754 755 756 757 758 759 760 761 762 763 764 765 766 767 768 769 770 771 772 773 774 775 776 777 778 779 780 781 782 783 784 785 786 787 788 789 790 791 792 793 794 795 796 797 798 799 800 801 802 803 804 805 806 807 808 809 810 811 812 813 814 815 816 817 818 819 820 821 822 823 824 825 826 827 828 829 830 831 832 833 834 835 836 837 838 839 840 841 842 843 844 845 846 847 848 849 850 851 852 853 854 855 856 857 858 859 860 861 862 863 864 865 866 867 868 869 870 871 872 873 874 875 876 877 878 879 880 881 882 883 884 885 886 887 888 889 890 891 892 893 894 895 896 897 898 899 900 901 902 903 904 905 906 907 908 909 910 911 912 913 914 915 916 917 918 919 920 921 922 923 924 925 926 927 928 929 930 931 932 933 934 935 936 937 938 939 940 941 942 943 944 945 946 947 948 949 950 951 952 953 954 955 956 957 958 959 960 961 962 963 964 965 966 967 968 969 970 971 972 973 974 975 976 977 978 979 980 981 982 983 984 985 986 987 988 989 990 991 992 993 994 995 996 997 998 999 1000

(a) irradiating a focused ion beam to a sample while supplying a material gas to form a deposit;

(c) deflecting the focused ion beam in a desired direction of said terrace based on a set amount from a focal position controlling apparatus;

(e) repeating said steps (b) to (d) in sequence to form a set micro three-dimensional structure.

2. A method of producing a micro three-dimensional structure according to claim 1, characterized in that a beam source is Ga^+ , Si^+ , Si^{++} , Be^+ , Be^{++} , Au^+ , or Au^{++} as liquid metal ions, or H^+ or He^+ as a gas ion source.

3. A method of producing a micro three-dimensional structure according to claim 1, characterized in that said material gas is WF_6 , $W(CO)_6$, $Mo(CO)_6$, $Fe(CO)_5$, $Ni(CO)_4$, $Au(CH_3)_2(ACAc)$, $Cu(HFACAc)_2$, or $Al(CH_3)_2$ as an

5 organometallic gas.

4. A method of producing a micro three-dimensional structure according to claim 1, characterized in that said material gas is pyrene ($C_{16}H_{10}$), styrene (C_8H_{10}), HMDS, or HMCTS as an organic gas.

5. A device for manufacturing a micro three-dimensional structure, characterized by comprising:

(a) a sample carried on a temperature variable sample stage;

5 (b) a focused ion beam source;

(c) a gas supply device; and

(d) a focal position controlling apparatus for a focused ion beam; and

(e) forming a deposit on said sample by focused ion beam assisted CVD, forming a terrace on said deposit, deflecting a focused ion beam in a desired direction of said terrace based on a set amount sequentially from said focal position controlling apparatus to form an overlying deposit, and forming a set micro three-dimensional structure.

6. A micro three-dimensional structure obtained by the method of producing a micro three-dimensional structure according to claim 1, wherein the micro three-

12. A micro three-dimensional structure obtained by
the method of producing a micro three-dimensional
structure according to claim 1, wherein the micro three-
dimensional structure is a wine glass having an outer
5 shape on an order of several micrometers.

13. A micro three-dimensional structure according to
claim 12, characterized in that the micro three-
dimensional structure is a micro wine glass having an
outer diameter of 2.75 μm and a height of approximately 12
5 μm .

14. A micro three-dimensional structure obtained by
the method of producing a micro three-dimensional
structure according to claim 1, wherein the micro three-
dimensional structure comprises diamond-like carbons made
5 by a Ga^+ focused ion beam at an accelerating voltage of 30
kV using pyrene ($\text{C}_{16}\text{H}_{10}$) as an organic gas.

11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100 101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119 120 121 122 123 124 125 126 127 128 129 130 131 132 133 134 135 136 137 138 139 140 141 142 143 144 145 146 147 148 149 150 151 152 153 154 155 156 157 158 159 160 161 162 163 164 165 166 167 168 169 170 171 172 173 174 175 176 177 178 179 180 181 182 183 184 185 186 187 188 189 190 191 192 193 194 195 196 197 198 199 200 201 202 203 204 205 206 207 208 209 210 211 212 213 214 215 216 217 218 219 220 221 222 223 224 225 226 227 228 229 230 231 232 233 234 235 236 237 238 239 240 241 242 243 244 245 246 247 248 249 250 251 252 253 254 255 256 257 258 259 260 261 262 263 264 265 266 267 268 269 270 271 272 273 274 275 276 277 278 279 280 281 282 283 284 285 286 287 288 289 290 291 292 293 294 295 296 297 298 299 300 301 302 303 304 305 306 307 308 309 310 311 312 313 314 315 316 317 318 319 320 321 322 323 324 325 326 327 328 329 330 331 332 333 334 335 336 337 338 339 340 341 342 343 344 345 346 347 348 349 350 351 352 353 354 355 356 357 358 359 360 361 362 363 364 365 366 367 368 369 370 371 372 373 374 375 376 377 378 379 380 381 382 383 384 385 386 387 388 389 390 391 392 393 394 395 396 397 398 399 400 401 402 403 404 405 406 407 408 409 410 411 412 413 414 415 416 417 418 419 420 421 422 423 424 425 426 427 428 429 430 431 432 433 434 435 436 437 438 439 440 441 442 443 444 445 446 447 448 449 450 451 452 453 454 455 456 457 458 459 460 461 462 463 464 465 466 467 468 469 470 471 472 473 474 475 476 477 478 479 480 481 482 483 484 485 486 487 488 489 490 491 492 493 494 495 496 497 498 499 500 501 502 503 504 505 506 507 508 509 510 511 512 513 514 515 516 517 518 519 520 521 522 523 524 525 526 527 528 529 530 531 532 533 534 535 536 537 538 539 540 541 542 543 544 545 546 547 548 549 550 551 552 553 554 555 556 557 558 559 560 561 562 563 564 565 566 567 568 569 570 571 572 573 574 575 576 577 578 579 580 581 582 583 584 585 586 587 588 589 590 591 592 593 594 595 596 597 598 599 600 601 602 603 604 605 606 607 608 609 610 611 612 613 614 615 616 617 618 619 620 621 622 623 624 625 626 627 628 629 630 631 632 633 634 635 636 637 638 639 640 641 642 643 644 645 646 647 648 649 650 651 652 653 654 655 656 657 658 659 660 661 662 663 664 665 666 667 668 669 670 671 672 673 674 675 676 677 678 679 680 681 682 683 684 685 686 687 688 689 690 691 692 693 694 695 696 697 698 699 700 701 702 703 704 705 706 707 708 709 710 711 712 713 714 715 716 717 718 719 720 721 722 723 724 725 726 727 728 729 730 731 732 733 734 735 736 737 738 739 740 741 742 743 744 745 746 747 748 749 750 751 752 753 754 755 756 757 758 759 760 761 762 763 764 765 766 767 768 769 770 771 772 773 774 775 776 777 778 779 780 781 782 783 784 785 786 787 788 789 790 791 792 793 794 795 796 797 798 799 800 801 802 803 804 805 806 807 808 809 810 811 812 813 814 815 816 817 818 819 820 821 822 823 824 825 826 827 828 829 830 831 832 833 834 835 836 837 838 839 840 841 842 843 844 845 846 847 848 849 850 851 852 853 854 855 856 857 858 859 860 861 862 863 864 865 866 867 868 869 870 871 872 873 874 875 876 877 878 879 880 881 882 883 884 885 886 887 888 889 890 891 892 893 894 895 896 897 898 899 900 901 902 903 904 905 906 907 908 909 910 911 912 913 914 915 916 917 918 919 920 921 922 923 924 925 926 927 928 929 930 931 932 933 934 935 936 937 938 939 940 941 942 943 944 945 946 947 948 949 950 951 952 953 954 955 956 957 958 959 960 961 962 963 964 965 966 967 968 969 970 971 972 973 974 975 976 977 978 979 980 981 982 983 984 985 986 987 988 989 990 991 992 993 994 995 996 997 998 999 1000 1001 1002 1003 1004 1005 1006 1007 1008 1009 1010 1011 1012 1013 1014 1015 1016 1017 1018 1019 1020 1021 1022 1023 1024 1025 1026 1027 1028 1029 1030 1031 1032 1033 1034 1035 1036 1037 1038 1039 1040 1041 1042 1043 1044

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Fig. 1(a)

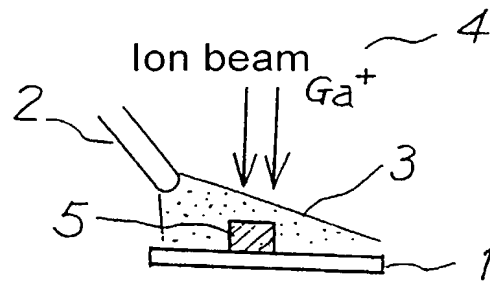


Fig. 1(b)

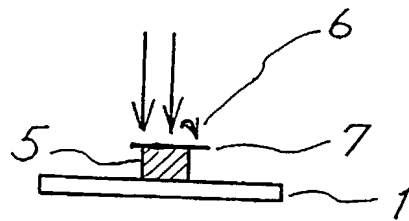


Fig. 1(c)

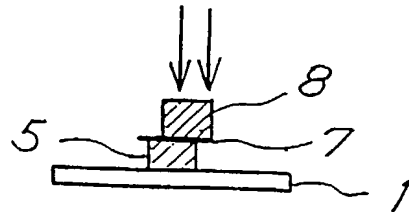


Fig. 2

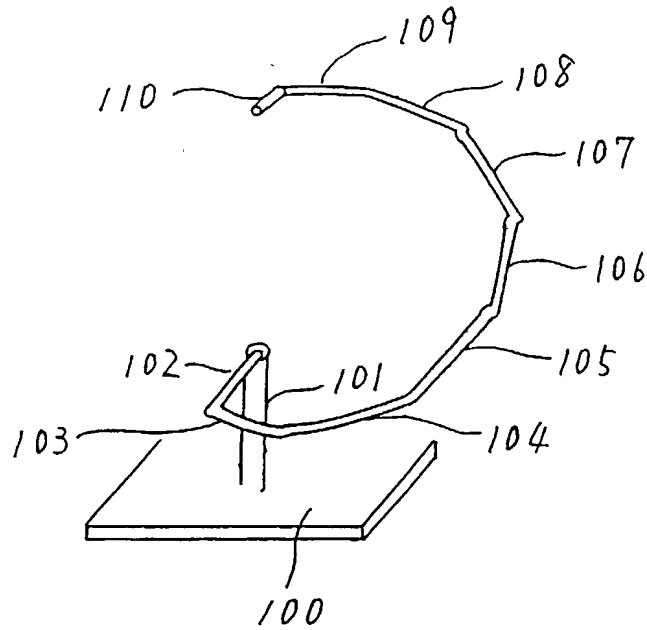


Fig. 3

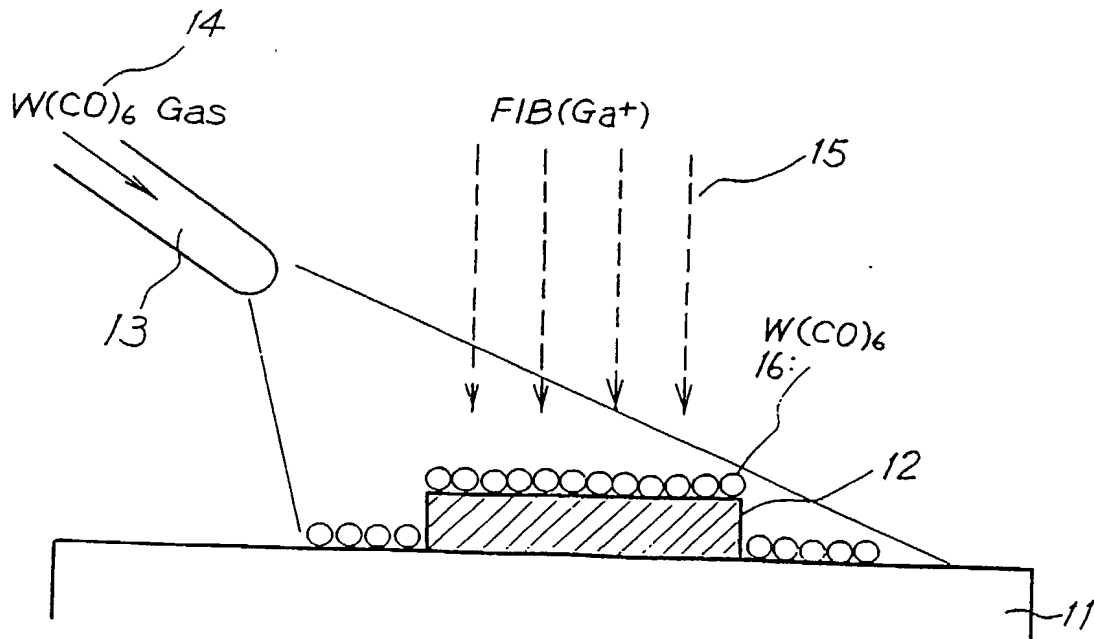


Fig. 4

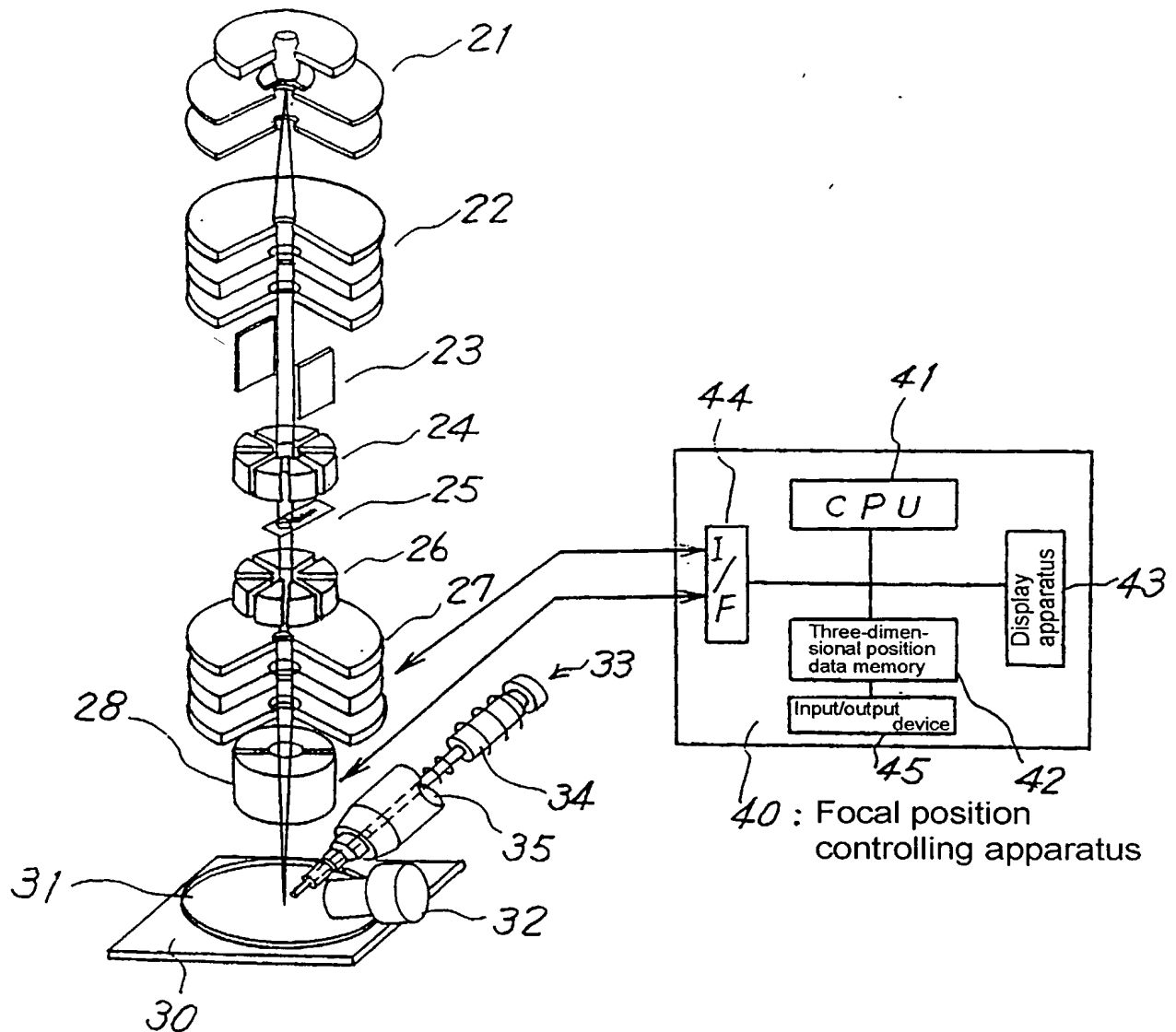


Fig. 5

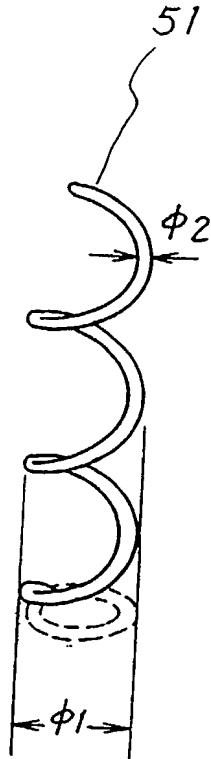
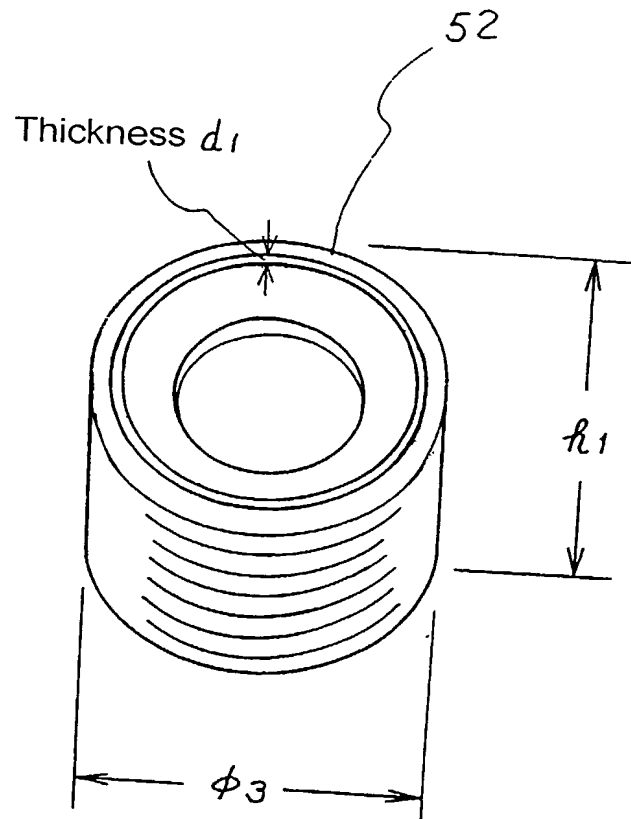


Fig. 6



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Fig. 7

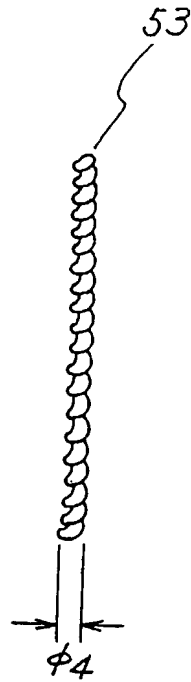
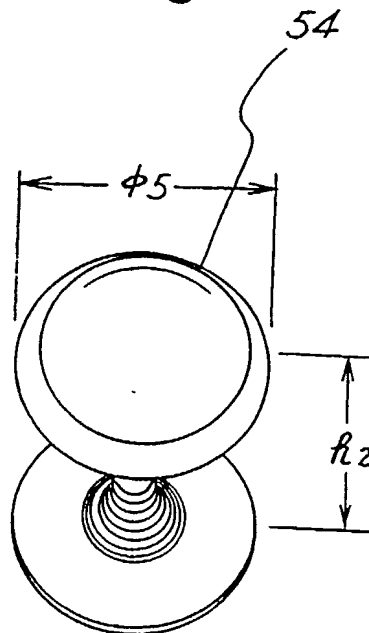


Fig. 8



DECLARATION AND POWER OF ATTORNEY

As a below named inventor, I hereby declare that my residence, post office address and citizenship are as stated below next to my name: that I verily believe I am the original, first and sole inventor (if only one name is listed below) or a joint inventor (if plural names are listed below) of the subject matter claimed and for which a patent is sought in the application entitled:

MICRO THREE-DIMENSIONAL STRUCTURE, PRODUCTION METHOD THEREFOR AND PRODUCTION DEVICE THEREFOR

which application is:

the attached application
(for original application)

PCT/JP00/05499, filed August 17, 2000
X application Serial No. 10/089,656
filed April 3, 2002, and amended on

(for declaration not accompanying application)

that I have reviewed and understand the contents of the specification of the above-identified application, including the claims, as amended by any amendment referred to above; that I acknowledge my duty to disclose information of which I am aware which is material to the patentability of this application under 37 C.F.R. 1.56, that I hereby claim foreign priority benefits under Title 35, United States Code §119, §172 or §365 of any foreign application(s) for patent or inventor's certificate listed below and have also identified on said list any foreign application for patent or inventor's certificate on this invention having a filing date before that of the application on which priority is claimed:

Application Number	Country	Filing Date	Priority Claimed (yes or no)
286337/99	Japan	October 7, 1999	Yes

I hereby claim the benefit of Title 35, United States Code §120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in a listed prior United States application in the manner provided by the first paragraph of Title 35, United States Code, §112, I acknowledge my duty to disclose any information material to the patentability of this application under 37 C.F.R. 1.56 which occurred between the filing date of the prior application and the national or PCT international filing date of this application:

Application Serial No.

Filing Date

Status
(patented, pending, abandoned)

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I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

Date July 16, 2002

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